

AMVER, the Automated Report System for Merchant Vessels

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NO CALL for help shall go unanswered, according to the tradition of the sea. And thanks to modern radio medical services, emergency first-aid procedures for the patient at sea are routine. A radio message describing the symptoms and condition of the patient is sent to a coastal radio station for relay to a medical facility ashore. A physician gives a diagnosis of the case and recommends emergency medical care with medicines and drugs in the ship's medicine chest. He also may recommend procedures for future care of the patient. Normally, in less than an hour his answer is sent back to the ship.

But what if additional care is needed? In answering this question, automation often lends a helping hand and, with a modern electronic computer, makes possible an international maritime mutual-assistance program—the Automated Merchant Vessel Report System (AMVER).

AMVER'S Background

The AMVER system, a program coordinated by the U.S. Coast Guard, was started in the western part of the North Atlantic Ocean in 1958. Operational and administrative responsibility for the system's center in New York City was assigned to the Commander of the Eastern Area. On July 12, 1965, AMVER's services were expanded into the Pacific Ocean under the cognizance of the Commander of the Western Area. Merchant vessels of all nations making

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offshore voyages are encouraged to voluntarily send sailing and position reports to the center via selected coastal, island, and ocean station vessel radio stations. Information from these reports is entered into an electronic computer, which generates and maintains dead-reckoning positions for the vessels while they are within the plotting area. The electronic "memory" includes important characteristics and medical information for about 17,000 of the larger merchant ships engaging in offshore international trade. Such data are invaluable for determining the search and rescue capabilities of these ships. This information, along with surface pictures that show the predicted locations of vessels, is made available to recognized search and rescue agencies of any nation or to persons in distress on the sea for use during an emergency.

The AMVER System

An excellent network of 40 radio stations, including 12 Canadian stations, enables AMVER to function in many parts of the world (see map). The stations in the Atlantic are located along the coasts of North and Central America, from Resolution Island in Canada at 60° north latitude to the Canal Zone at 10° north latitude. Four U.S. Coast Guard ocean station vessels and radio stations at Bermuda, Puerto Rico, and the Azores provide coverage for the mid-Atlantic. The Pacific network includes 12 coastal and ocean stations, limited by Kodiak, Alaska, on the north; Balboa, Canal Zone, on the south; and Guam, Marianas, on the west. The AMVER system consists of this network of stations, 15 rescue centers in the Atlantic and

Pacific, the electronic data-processing center in New York, and the participating merchant ships.

Subsidiary rescue centers as well as primary rescue centers are operated by other countries under the cognizance of the International Civil Aviation Organization. Canada and the U.S. Navy and Air Force operate others.

A new electronic computer system was installed at the AMVER center in November 1964. It is used to maintain a continuous daily plot of more than a thousand merchant ships as they travel the Atlantic sea lanes. The system was designed and the computer programed for capabilities of maintaining a world plot of merchant ships. When this computer system was used for the first time on December 15, 1964, the plotting area was expanded immediately to include the entire Atlantic region. The Pacific plot is small but growing rapidly. Ships are now being plotted to destinations throughout the world. Plots are started as soon as sailing plans are filed with the existing radio network. Data on ships flying the flags of more than 60 maritime nations have been plotted since the AMVER program was started in 1958. Additional radio stations are needed before the full potential of the system can be realized.

All radio stations in the network relay messages from ships to the New York center over several teletype networks. The teletyped reports are received on a printer that is located only a few feet from the computer. The messages are checked and evaluated manually, and the information is placed in the proper format for use in the automatic data-processing equipment. The data are then keypunched into a standard tabulating card and verified before being entered into the computer. Accuracy is of the greatest importance.

The computer generates an electronic sailing plan or corrects one already plotted, then stores the results on magnetic "memory" disks, ready for instant use during an emergency or to routinely calculate new positions for each of the ships at 12-hour intervals.

The computer also predicts the positions of ships along the routes of aircraft with probable emergencies. Information is added concerning

communications and other capabilities of the ships, which are listed in the order in which the plane will pass abeam the ships. All the information is sent by teletype to the aircraft oceanic controller, who passes it by voice radio to the pilot of the aircraft. Sometimes the controller of the rescue coordination center can pass the information to the pilot by telephone at a radio station. While flying time still remains, the pilot can arrange to bail out or ditch near a vessel, which saves critical time in recovering the survivors. If the alert does not develop into a true distress, the plane can continue to its destination.

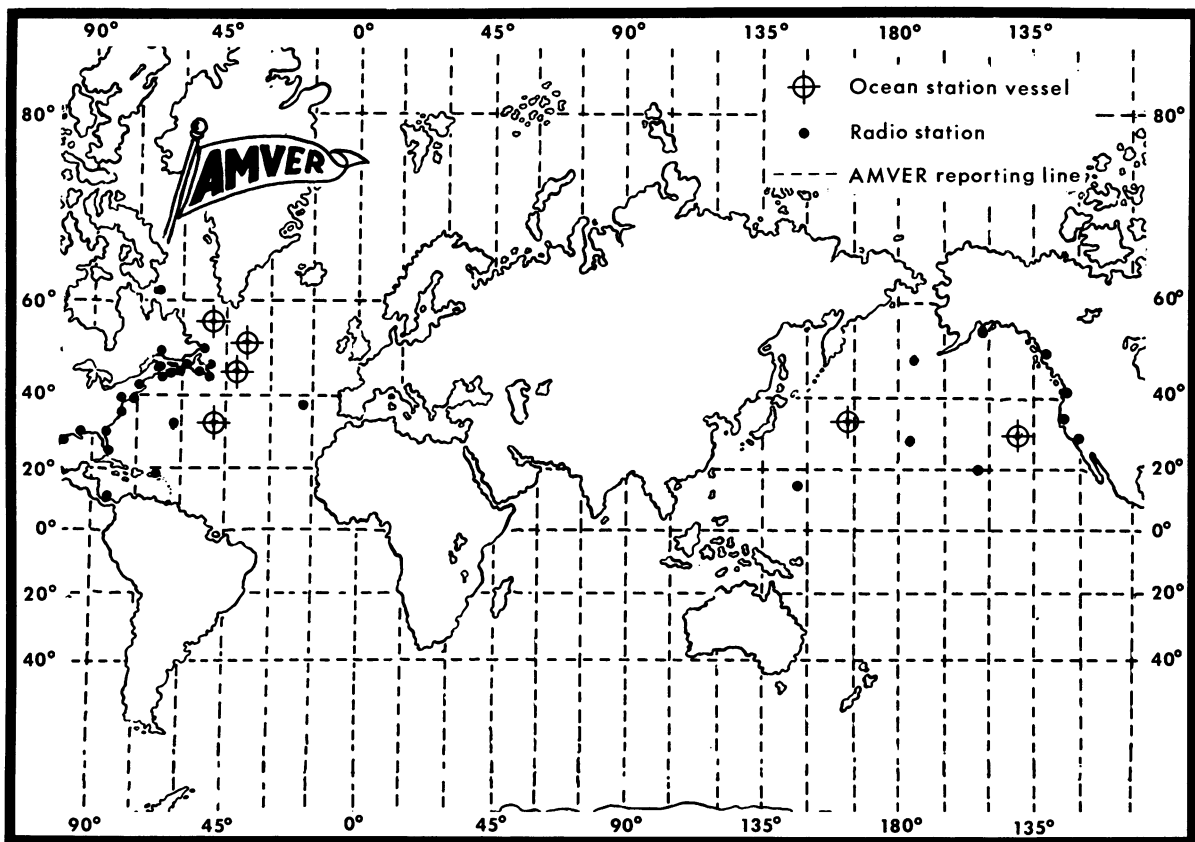
About once a day, a person at sea needs better medical care than is available on his ship. Since the ship is not in distress, only an "all ships call" is available to arrange assistance from other ships. This is an inefficient procedure because 90 percent of all ships do not stand a radio watch more than one-third of the time.

Sometimes evacuation to another ship's hospital is arranged, and an emergency operation is performed at sea. Use of a surface picture is helpful if evacuation of the patient is necessary. If a physician is not suitably located to assist, it is often possible for an outbound ship to transfer the patient to an inbound ship for hospitalization ashore. This procedure saves the money and time that would be necessary for the outbound ship to return or divert to port.

There are many emergencies at sea for which a summary of potential assistance in the area can save valuable time and reduce the volume of communications otherwise required to resolve the emergency.

AMVER'S Surface Pictures

If a rescue coordination center requests a surface picture, the AMVER center can respond almost instantly. An experienced "watch stander" is always on duty to interrogate the computer through a remote inquiry typewriter. He sets the date and time for which a specified ocean area is to be electronically searched for potential assistance. The area may be a circle of any radius, a rectangle of any size, or a path of any width along the track of a ship or air-



AMVER ocean station vessels, radio stations, and reporting lines

craft. Almost at once, the computer printer begins to list ships with their positions and other valuable information concerning each ship. The list includes the name of the ship, its international call sign, position by latitude and longitude, time of position, course, speed, radio watch schedule, availability of physician and radar and radio telephone, destination, and estimated arrival at destination.

The computer punches another card with the same information for each ship. The cards are used in data-transmission equipment to send the surface picture over the teletype networks to the requesting rescue coordination center. The entire operation normally takes less than 10 minutes from the time the request is received to transmission of the surface picture.

AMVER surface pictures have assisted in many search and rescue operations at sea. During an average month, almost 100 surface pictures have been provided to resolve actual or potential emergencies. Use of the pictures in the

following crises saved valuable time and a number of lives.

On July 1, 1962, a 17-year-old Norwegian crewman was injured in a fall on the motor vessel *Glyfe*, which was located about 500 miles east of Argentina, Newfoundland. Soon after the incident, the Panamanian liner SS *Homer* rendezvoused with the *Glyfe* and provided emergency treatment, which was believed to be satisfactory. Both vessels then continued on their original passages. The patient had a relapse, and the *Glyfe* called the Coast Guard ocean station Charlie requesting further assistance. Ocean station Charlie continued to act as a communications link for the remainder of the incident. An AMVER surface picture reached the British liner SS *Carinthia*, which rendezvoused and took aboard the injured crewman.

Medical examination showed that emergency surgery, in addition to critical medical supplies and blood, would be required to save the boy's

life. The Royal Canadian Mounted Police rushed antibiotics to the Coast Guard air detachment at Argentia, and the Red Cross provided the blood, which was flown by a U.S. Air Force plane from McGuire Air Force Base in New Jersey. As ocean station Charlie provided radar bearings, a Coast Guard aircraft successfully dropped the critical supplies to Charlie, which were then transferred to the *Carinthia*. The surgery was as successful as the mission, and the crewman's life was saved.

On February 18, 1964, the 442-foot British freighter *Ambassador* drifted freely 660 miles southeast of Halifax, Nova Scotia. She had a 50-degree list, and her portside was awash with heavy seas backed with winds peaking hurricane force. Crewmen huddled near the bow awaiting a rescue lifeline to take them from the stricken ship to the 311-foot Coast Guard cutter *Coos Bay* (see photograph).

Overhead an aircraft kept vigil to spot men and liferafts in the water. Twenty of the *Ambassador's* 35-man crew were brought to safety. The *Ambassador* sank February 21 while being towed to the Azores, 3 days after the British freighter and her crew began a fight for survival.

On July 23, 1964, an aircraft sighted four men on a raft 340 miles north northwest of Bermuda. The British merchant ship *Maidan*, appearing on a surface picture, was estimated to be only 8 miles from the scene. Communications were established, her position verified, and the *Maidan* rescued the four persons from the raft that they had occupied since their motor sailer had sunk 8 days before.

On February 6, 1965, an Air Force plane over the Atlantic en route to Miami, Fla., reported an engine on fire and that the plane was losing altitude. As a precautionary measure, AMVER prepared a surface picture that included 15 ships along the plane's trackline. Fortunately, the plane was able to continue airborne and to land safely at Miami.

On February 19, 1965, the SS *Maria Despina*, about 800 miles southeast of Bermuda, reported to the U.S. Coast Guard in Bermuda that she had a man overboard and needed help in conducting a search. AMVER immediately prepared a surface picture for the area, and the four ships shown by picture to be in the area

were asked to keep a sharp lookout for the missing man. Search planes from Bermuda joined the search, but the man was not found.

On March 3, 1965, the Coast Guard station in New York was informed by the Coast Guard cutter *Campbell*, then manning ocean station Charlie, that one of her crewmembers had requested emergency leave. The crewman was deeply concerned about his mother, who had been stricken with cancer; but the problem was how to get him back to the U.S. mainland. The *Campbell* could not return from her weather station for at least another week, and only a transfer to another ship inbound to the United States could help. A call was put in to the AMVER center for assistance.

AMVER was asked to locate all ships east of ocean station Charlie that would pass near inbound to the U.S. coast. Its computer provided surface pictures of the area, but no ships were found to be favorably located until March 6, when the *American Scientist* was predicted to be within the area en route to Boston. The *American Scientist* readily offered her aid and rendezvoused with the *Campbell* so that the coast guardsman could return home.

On March 10, 1965, an alert was declared for an Air Force C-119 with which communications had been lost. The plane had departed from Bermuda for Charleston, S.C., with six persons on board. It was last in contact with Andrews Air Force Base, Washington, D.C. The Coast Guard AMVER center was asked to furnish a precautionary trackline surface picture along the course of the plane to locate any vessels that might have spotted the missing aircraft. Fortunately, a Navy plane contacted the C-119, and the alert was cancelled. However, if the plane had been lost, there were 24 ships that were predicted by the AMVER computer to be within the surface picture area as a potential search and rescue force.

It is the responsibility of the rescue centers to evaluate the surface pictures and to use them with information available from other sources. Sometimes the intentions of shipmasters change but are not reported to AMVER. Mistakes may happen along the chain of communication; therefore, the actual positions of ships must be verified before a final decision is made to rendezvous.



The 442-foot British freighter *Ambassador*, her portside awash with heavy seas backed with winds peaking hurricane force

—U.S. Coast Guard photograph

To prevent information from being used to commercial advantage, the predicted positions of ships included in surface pictures are not publicized except if needed in resolving an incident.

Surface pictures are available to any rescue coordination center to support the obligation of search and rescue agencies of any country. AMVER information is provided on request at the average rate of three times a day to assist in resolving potential or actual emergencies on or over the sea.

The U.S. Weather Bureau makes a rather unusual use of surface pictures. The bureau may request a surface picture for the area surrounding an embryo storm when insufficient weather reports are available from ships that report regularly. Special reports are requested by the Weather Bureau for ships that are predicted by AMVER to be in critical positions. These special reports permit the intensity and movement of the storm to be estimated and forecast more quickly to warn coastal areas and shipping.

Participation in Program

The maximum effectiveness of the AMVER program is largely dependent on the active participation and cooperation of members in the international maritime community: ship-owners, shipmasters, government agencies, maritime organizations, communications networks, and search and rescue organizations. Cooperation is essential if the inherent potential of AMVER is to be achieved. The benefits increase with participation as the accuracy, density, and area of the computer plot increase.

Participation in AMVER is wholly voluntary, and nothing more is expected of a ship during an emergency than the assistance that shipmasters customarily give to fellow mariners in distress. Many search and rescue emergencies do not meet the criteria for distress assistance. Delays are costly to shipping companies, and ships are not asked for help when long delays are involved unless it is essential—and then only for the minimum time that is required.

New records were set for participation in AMVER in March 1965. The daily average of 938 vessels plotted surpassed the old record average of 934 set in May 1964. A new all-time high of 1,064 ships plotted in a single day was set over the old mark of 1,030 in March 1964. As the plotting area has been expanded over the entire Atlantic Ocean, more vessels are being plotted into South American and African ports, which partly accounts for the following records:

<i>March 1965 activities</i>	<i>Number of operations</i>
Passages plotted.....	5,919
Separate vessels plotted.....	2,874
Vessels plotted daily :	
Average	938
Maximum per day.....	1,064
Vessels newly participating in AMVER system..	69
Surface pictures furnished :	
For possible evacuation on physician's advice	21
Aircraft alerts/distress.....	18
Disabled or missing vessels.....	2
Miscellaneous	22
Total pictures.....	63

A ship's size does not limit its active participation in the AMVER program. About the

only qualification the ship needs is the ability to engage in long-range, two-way communications. Ships are usually 1,000 gross tons or larger, and normally they report only offshore passages of more than 1 day. There are no agreements to sign nor special obligations to be incurred. Ships of all nations are invited to join the program. Instructions that guide participation are issued in 13 languages and are revised as major improvements are made in the system.

It is the responsibility of a ship's owner, operator, or master to instruct his radio officer to transmit movement and position reports to the AMVER center during the course of a passage. The reports are filed voluntarily, at no cost to the ship, through any cooperating radio station. These reports are crucial to the effectiveness of the program. The computer can maintain a mathematically accurate plot of a ship's advancing position by dead-reckoning navigation only to the extent that the ship follows the speed and passage routing last reported to AMVER. Position reports are encouraged at approximately a 15° change in latitude or longitude, depending on direction of travel. Frequent reports increase the accuracy of the plots.

Positions included in ship weather-observation reports are correlated with positions predicted by the computer from AMVER sailing plans. Since only a small percentage of the merchant ships participate in the world meteorologic program, other position reports are needed from most ships.

Comments

AMVER has received wide international support from many persons as well as civilian and governmental organizations. The 1960 Conference on Safety of Life at Sea adopted a recommendation urging contracting governments to encourage all ships to report their positions when traveling in areas where arrangements are made to collect their positions for search and rescue operations. Subsequently, the Maritime Safety Committee of the Inter-Governmental Maritime Consultative Organization reported in 1963 that these arrangements are contribut-

ing to the success of search and rescue. Every effort is being made to induce ships to participate in the program.

Centro Internazionale Radio-Medico (CIRM), the Italian radio medical volunteer service that provides urgently needed medical aid at no cost to ships at sea, has endorsed AMVER, and their cooperation is bringing mutual benefits. Communications organizations have been helpful; so have the marine sections of many consulates and various governmental agencies having responsibilities related to maritime safety. Both management and labor associated with shipping are helping to establish

participation as a standard practice. The news media have been especially helpful in informing the maritime world about current developments.

With the active support and cooperation of so many persons associated with the safety of life and property at sea, AMVER will continue to grow. Many people, such as Public Health Service physicians, are concerned with the welfare of seamen and are vital links in this mutual assistance program. A major portion of the credit for AMVER's success belongs to the assistance given by these people, as well as the men of the sea.

Education Notes

Training Methods and Aids. The Public Health Service's Communicable Disease Center, Atlanta, Ga., has announced the 15th annual series of courses on training methods and aids. The series consists of three consecutive 1-week courses originally designed for the center's training branch staff.

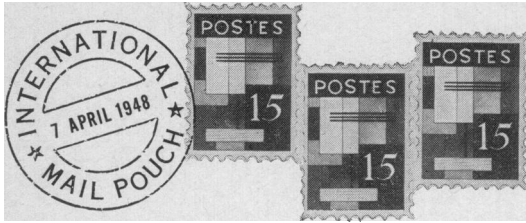
The first course, scheduled for Sept. 27 to Oct. 1, 1965, will review current training methods and introduce newer techniques. It will include such topics as the determination of training needs and objectives, design of short courses, group involvement techniques, preparation of field demonstrations, conduct of case studies, selection and use of training aids, and office in-basket technique, which enables the student to cover rapidly many of the processes of decision making.

The feasibility of preparing low-cost training aids from readily available supplies will be demonstrated in the second course on the preparations and use of training aids, Oct. 4-8. The development of teaching presentations will be offered in the third week, Oct. 11-15. Designed to provide professional personnel with practice in preparing and giving oral presentations and demonstrations, this course will cover the selecting of a technique, the planning and organizing of the presentation, and the preparing of materials.

For further information write: Chief, Training Branch, Communicable Disease Center, U.S. Public Health Service, Atlanta, Ga. 30333.

Epidemiology. The training branch of the Communicable Disease Center, Public Health Service, will conduct a multidiscipline course in principles of epidemiology, Jan. 10-14, 1966, as part of its continuing program. The course is designed to provide public health workers with a basic understanding of the use of epidemiologic techniques in disease prevention. It is offered for physicians, dentists, veterinarians, nurses, laboratory workers, environmental health personnel, and other members of the public health team. Preference will be given to applicants whose professional tasks involve epidemiologic procedures. For information and application forms write: Chief, Training Branch, Communicable Disease Center, U.S. Public Health Service, Atlanta, Ga. 30333.

Home Study for Sanitarians. The Communicable Disease Center, Public Health Service, now offers a series of home study courses for sanitarians. They provide 11 lessons in 3 subjects: mathematics, communicable disease control, and insect and rodent vector control. The Center prefers that official health agencies or educational institutions arrange for and administer the courses, but individuals may make special arrangements for enrollment. No tuition or registration fee is required. Applications or requests for information should be addressed to the Communicable Disease Center, attention: Chief, Training Branch, Atlanta, Ga. 30333; or to the Public Health Service Regional Office, attention: Chief, CDC Services.



Medical Care for Andean Indians

Through arrangements with two international agencies, the Bolivian government is developing a health program for some 2,600,000 Quechua and Aymara Indians, two-thirds of the country's population.

The Pan American Sanitary Bureau is participating in the plans for providing needed public health services to these Andean mountain people. The projects include vaccination campaigns, safe water, education in better nutrition, and regular checkups of children at least from birth to school age.

The U.N. Children's Fund has pledged medical supplies and equipment worth more than \$100,000 to help outfit a hospital and 16 health centers. Four of these centers have already been constructed. They are located at Otavi, Pillapi, and Playa Verde in the altiplano and at Cotoca.

Technical Aid for the U.S.

The United States is now receiving technical assistance from the Pan American Sanitary Bureau, regional office of the World Health Organization, in a project to wipe out *Aedes aegypti* in nine southern States, Puerto Rico, and the Virgin Islands. Sixteen Western Hemisphere countries and territories have already successfully eradicated the mosquito.

Dr. Vicente P. Musa of Brazil, a bureau expert, aided U.S. public health officials at the Communicable Disease Center, Public Health Service, Atlanta, Ga., in planning and organizing the campaign and is assessing the fieldwork in progress in south Florida; Texas, along the U.S.-Mexico border; Puerto Rico; and the Virgin Islands.

The program will be extended to other infested areas in Alabama, Arkansas, Georgia, Louisiana, Mississippi, South Carolina, and Tennessee.

Isotope Radiography

Medical radiographs can now be made in electricity-starved areas by a method which uses only the nuclear energy from a radioactive isotope. A portable system using ytterbium 169 and weighing only 200 pounds has been developed by the Viso Corporation of Detroit, Mich.

The U.S. Agency for International Development, in cooperation with the Bolivian Ministry of Health, sponsored use of the system in a survey to detect tuberculosis and silicosis. Project HOPE has used a general diagnostic version in its hospital ship in Ecuador and Guinea.



Young Chacobo Indian girl being given a chest X-ray by a portable tuberculosis survey system, Bolivia